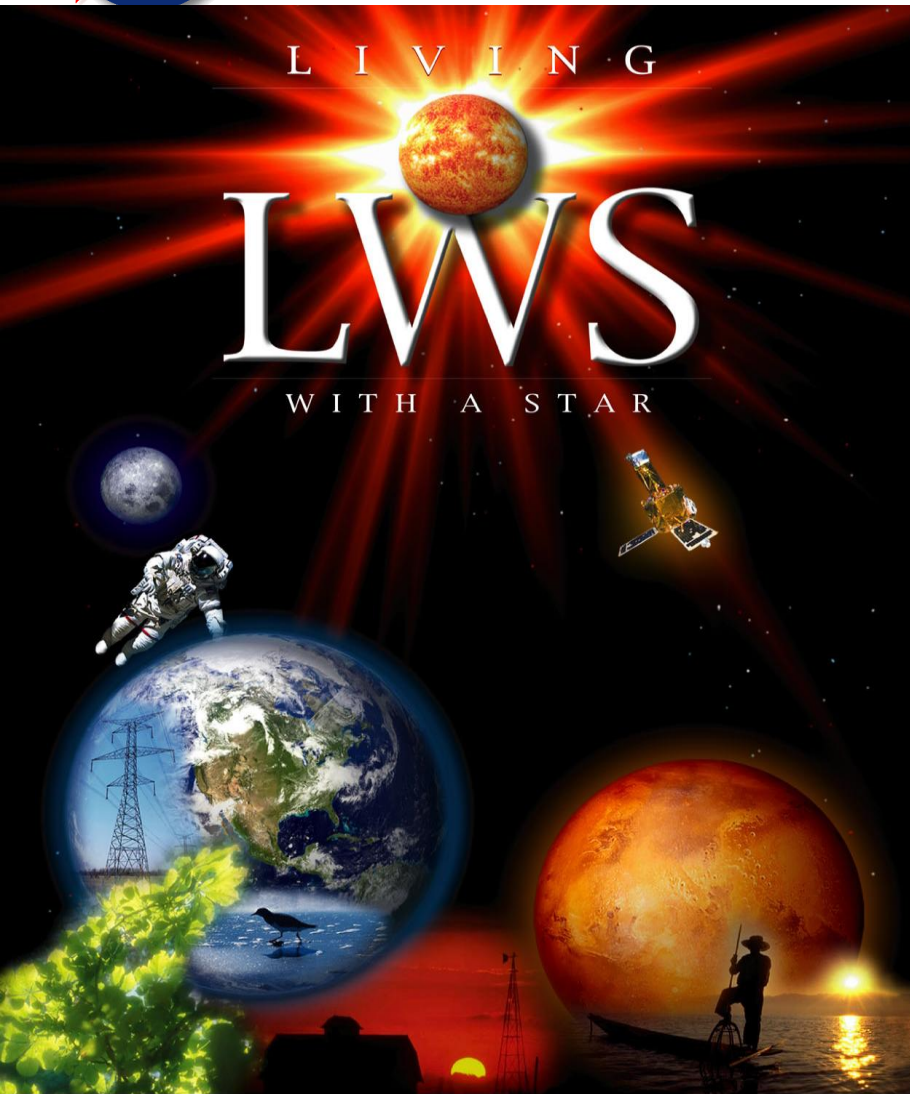




Solar Probe Plus: Humanity's First Visit to a Star



Living With a Star (LWS) is a space-weather focused and applications-driven research program. Its goal is to develop the scientific understanding necessary to effectively address those aspects of the connected Sun-Earth system that directly affect life and society. The program is implemented by a series of inter-related science missions, space environment testbed and targeted theory, modeling and data analysis programs.



Solar Probe Plus (SPP) Investigations AO Pre-Proposal Conference Living With A Star (LWS) Program

Dr. Lika Guhathakurta
Solar Probe Plus Program Scientist

Science Mission Directorate
NASA Headquarters

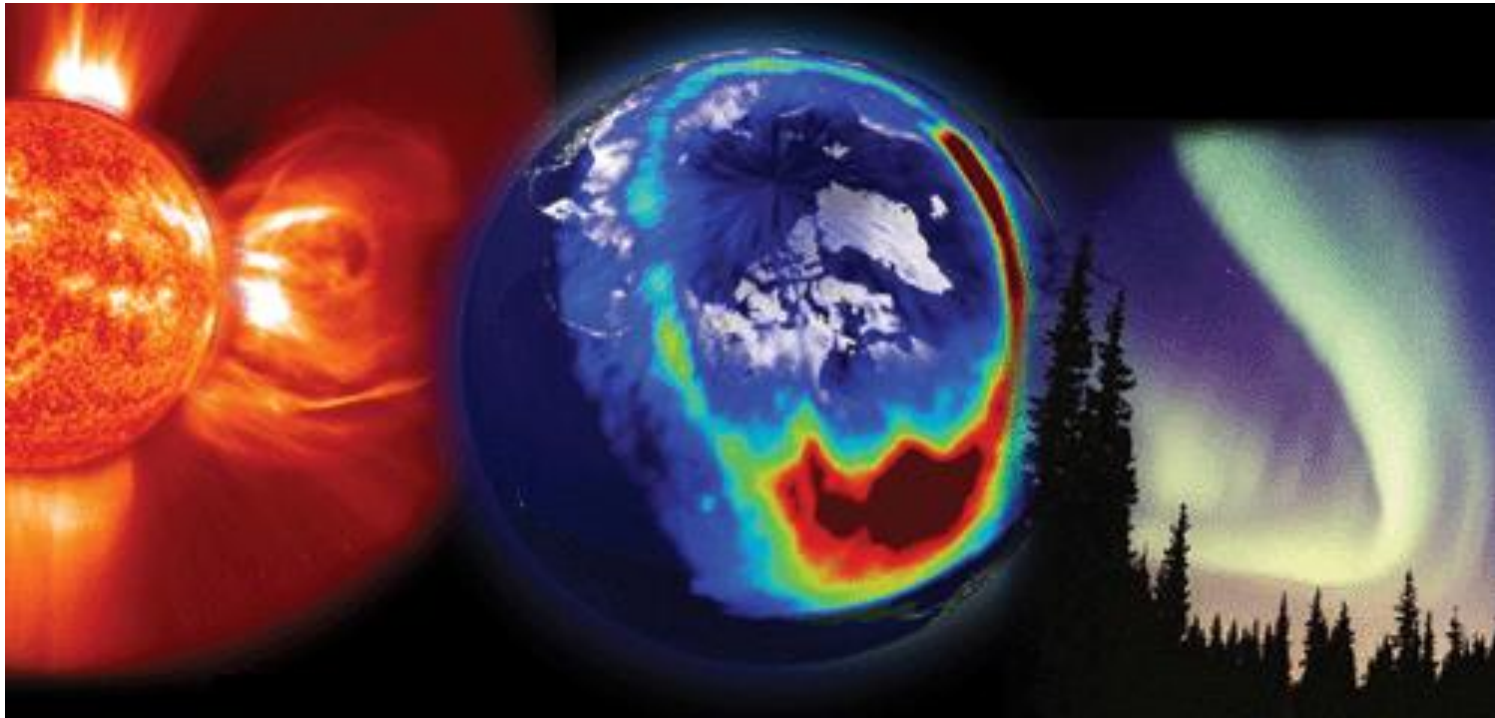
January 7, 2010

held at Metro Center, Washington DC, January 7, 2010



Living With a Star (LWS) Program Goal

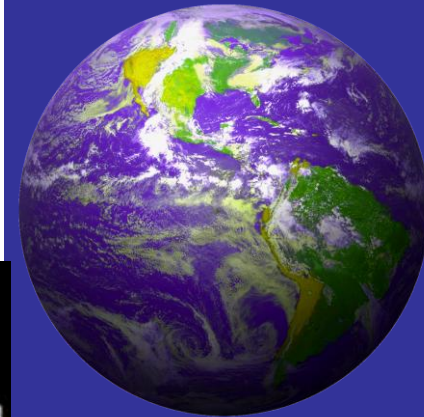
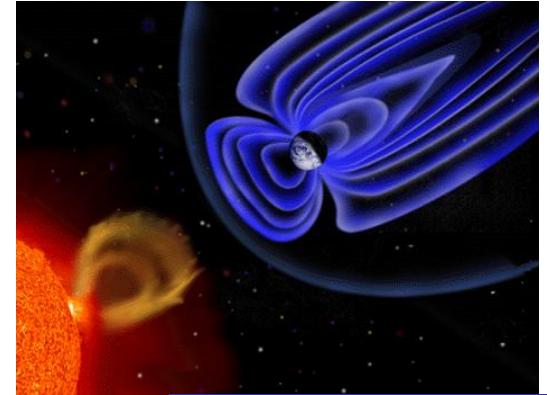
LWS Program Goal: Develop the scientific understanding necessary to effectively address those aspects of the connected Sun Earth system that directly affect life and society.





Why Do We Care?

- **Solar Variability Affects Human Technology, Humans in Space, and Terrestrial Climate.**
- **The Sphere of the Human Environment Continues to Expand Above and Beyond Our Planet.**
 - Increasing dependence on space-based systems
 - Permanent presence of humans in Earth orbit and beyond





GLOBAL SOCIETAL CONSEQUENCES OF SOLAR VARIABILITY



Human Radiation Exposure

- Space Station
- Space Exploration and Utilization
- High Altitude Flight



Impacts on Technology

- Space Systems
- Communications, Navigation
- Terrestrial Systems

Terrestrial Climate

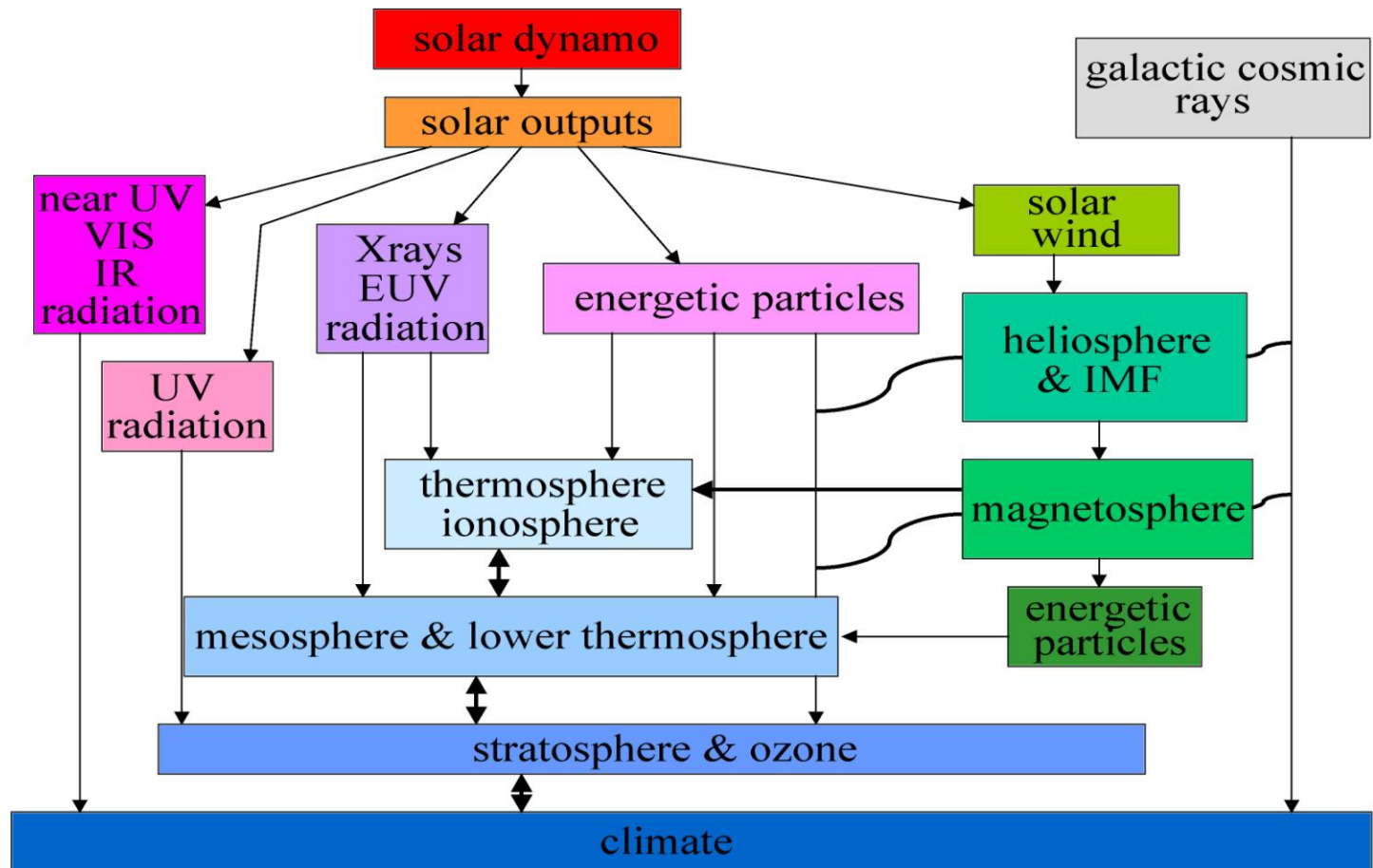
- Short Term
- Long Term



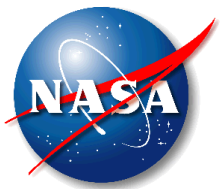


LWS is a Systems Approach

LWS focuses not on any one region of space, but rather on our Sun Earth Region as one system.

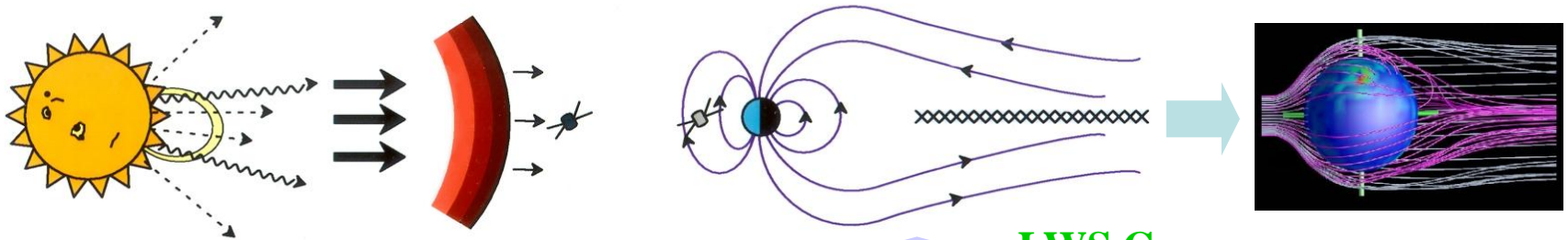


A very important part is the study of the connection between the regions and how one drives a response in another.



Prediction Requires Understanding. Understanding Requires a System-Wide Approach

How do we link what happens at the Sun with the planetary response?



**STEREO, SDO,
Solar Probe**

**ACE, STEREO,
Solar Orbiter**

LWS Geospace
Measure at Earth
Model at Planets

Observing the Source
Active Regions
X-ray, EUV, UV
Energetic Particles
Solar Wind

Characterizing Propagation
Solar Energetic Particles
Coronal Mass Ejections
I. P. Shocks

Understanding planetary responses
Ionosphere-Upper Atmosphere
Radiation Processes
Space / Atmosphere Interactions



Scope of the LWS Program

The first phase of the LWS strategic program elements are:

- Solar Dynamics Observatory (SDO)
- The Geospace Missions Network
- Solar Orbiter
- Solar Probe Plus
- Space Environment Testbeds
- Targeted Research and Technology



Living With A Star Program

- The LWS Program objectives are:
 1. Understand solar variability and its effects on the space and Earth environments with an ultimate goal of a reliable predictive capability of solar variability and response.
 1. Obtain scientific knowledge relevant to mitigation or accommodation of undesirable effects of solar variability on humans and human technology on the ground and in space.
 2. Understand how solar variability affects hardware performance and operations in space.



Purpose of the LWS Solar Probe Plus Mission

LWS was established to address compelling questions of scientific importance that directly affect life and society.

Background

Solar Probe is a mission designed to explore the processes and conditions that drive our planet. It will be humanity's first visit to another star, and will explore a region of the solar system previously thought inaccessible.

Why do we care?

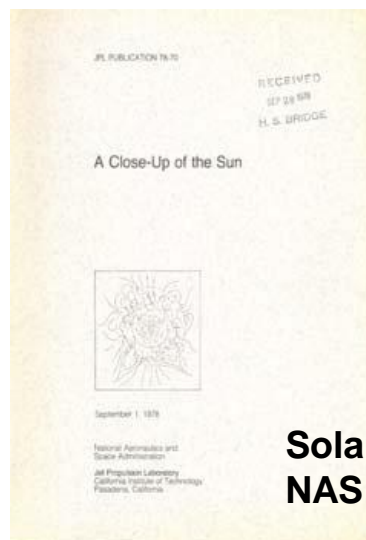
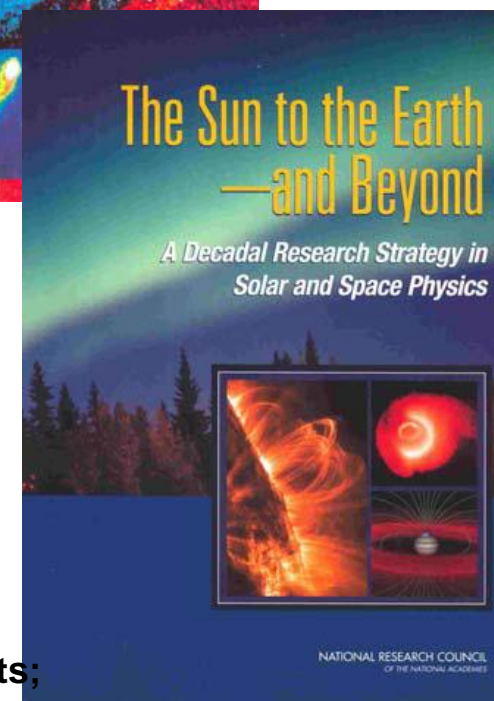
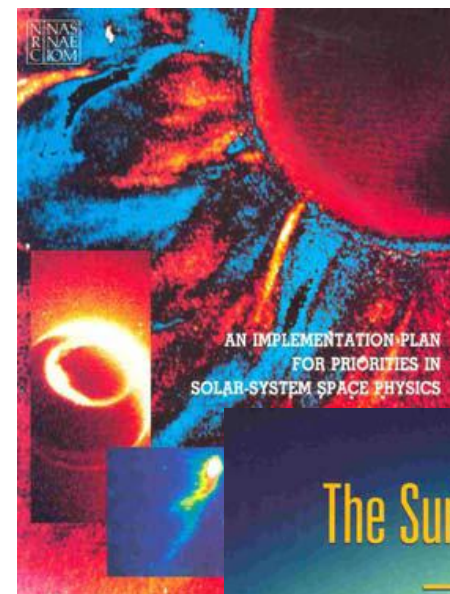
The Sun drives the Earth. One of the great discoveries of the era of space exploration was the realization that the strength of the Sun's magnetic field at the earth is similar to the magnitude of the Earth's own magnetic field. Solar Probe is designed to investigate the basic mechanisms of the generation and flow of the solar wind, the process that links the Sun's magnetic field to the Earth.

Background/Justification

The past decade has yielded new results concerning the importance of the solar wind to the transfer of momentum and energy from the solar magnetic field to the earth. The conditions of the wind, distribution in space, density, chemical composition, and velocity are now known to be set rather near to the Sun, perhaps frozen into the flow within a few solar radii from the visible surface. The best hope for understanding the process(es) of the generation of the wind from our star is to investigate the wind close to the star.



Solar Probe History (1958 -present)



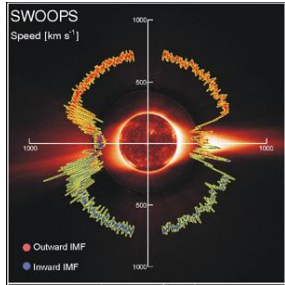
Solar Probe studies, reports;
NAS: 1962, 1985, 1995, 2000

on the proposal conference,

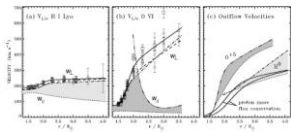
astro Center, Washington DC, January 7, 2010



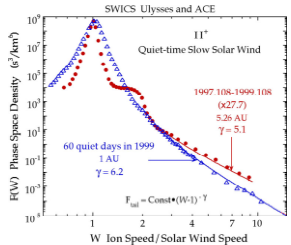
Science Objectives



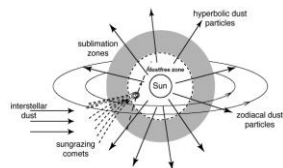
- Determine the structure and dynamics of the magnetic fields at the sources of the fast and slow solar wind



- Trace the flow of energy that heats the corona and accelerates the solar wind



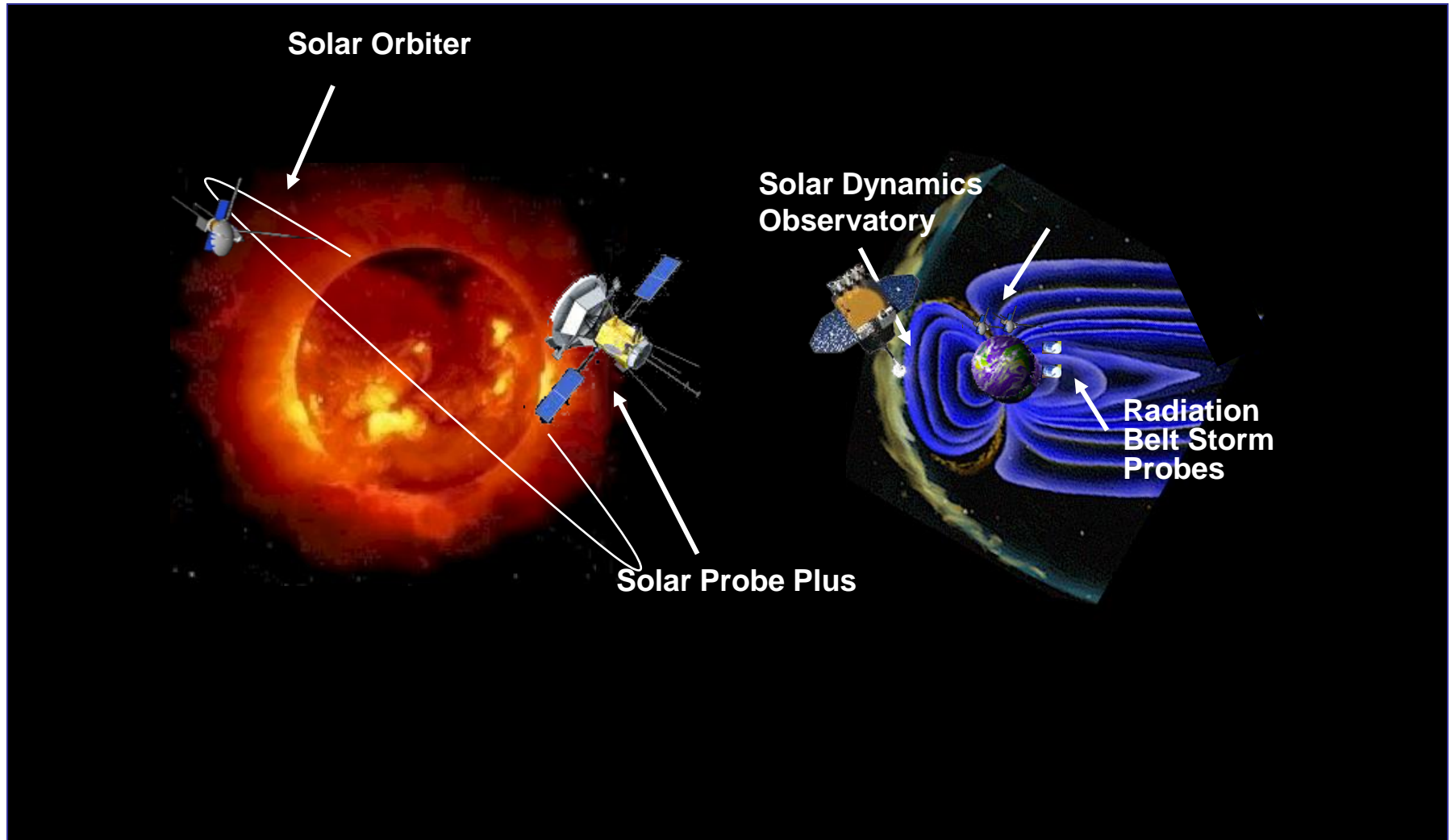
- Determine what mechanisms accelerate and transport energetic particles



- Explore dusty plasma phenomena in the near-Sun environment and their influence on the solar wind and energetic particle formation

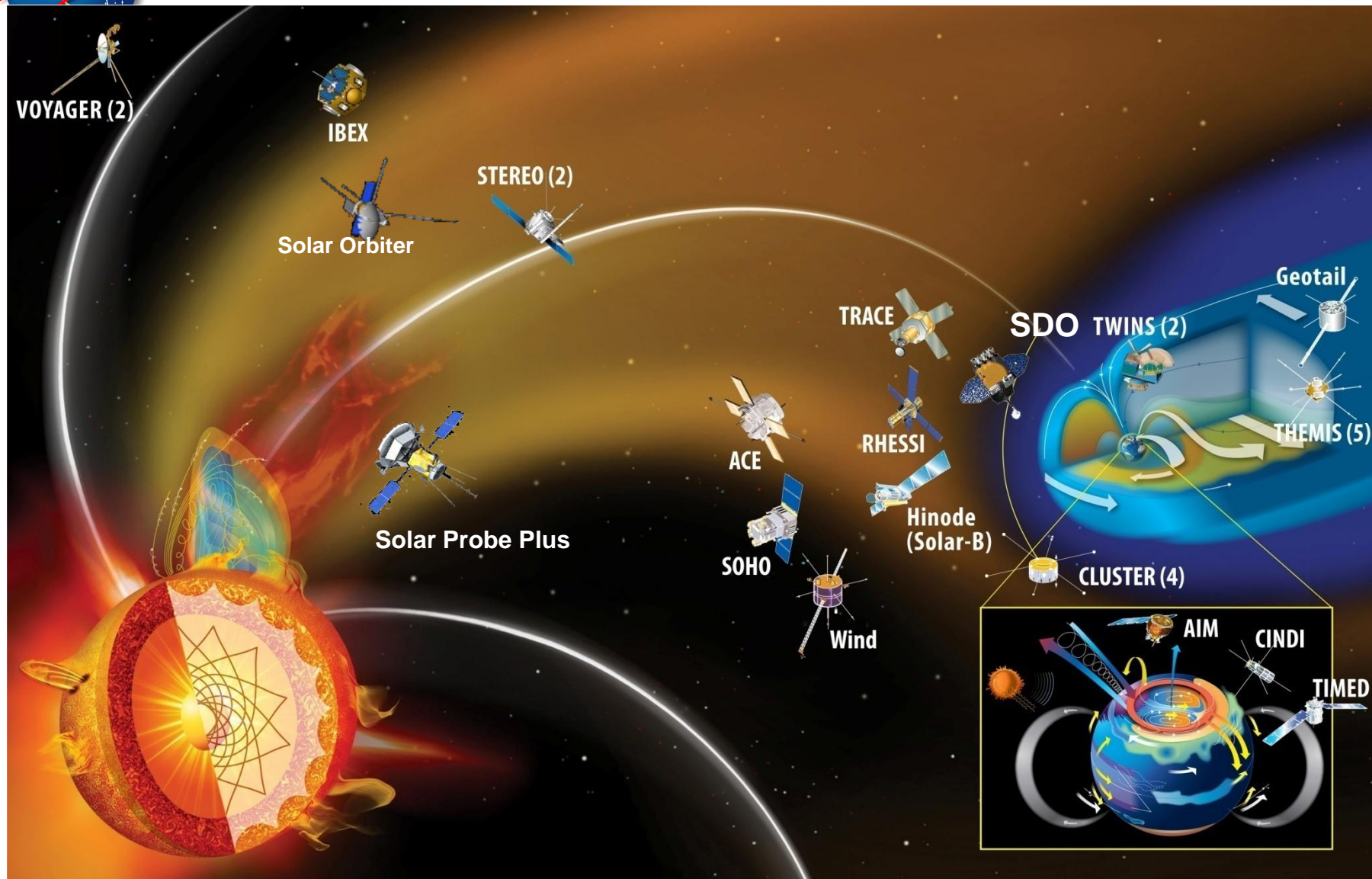


LWS Research Network





Heliophysics System Observatory



For Heliophysics Research